LABORATORY ASSESSMENT OF VIABILITY AND GERMINABILITY TESTS FOR SUGARGRAZE AND COLUMBUS GRASS SEEDS

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ABSTRACT

The experiment was conducted to assess the two forage sorghum seeds viabilities and germination percentages. The experiment was conducted in the Laboratory of Animal Science Department, Federal University Dutse, Jigawa State. The experimental materials were Sugargraze seeds (had same nature with food sorghum seeds) and Columbus grass seeds (were hard with scaly coat in nature) sourced from National Animal Production Research Institute (NAPRI) Shika, Zaria. The data collected for viability test was subjected to T-test using Microsoft excel (10th Edition) for the determination of germination percentages. The seed germination test methods (between paper method) were used; two hundred (200) seeds each of Sugargraze and Columbus grass were used, replicated ten times with twenty (20) seeds per Glass Petri dish and kept at room temperature (28 – 30 0C) for seven (7) days. Petri dishes were checked daily, counted and recorded for the sprouted seeds for determination of percentage germination rate in each replication. The results showed that the percentage germination increased significantly with increasing days of germination among all the cultivars. Columbus grass, which showed germination rates of 39.50%, 70.50%, and 81.50% at 2, 4, and 6 days, respectively, Sugargraze showed germination percentages of 58.50% and 92.50% at days 2 and 4. The whole germination time for Columbus grass seeds was 6 days, whereas Sugargraze seeds needed just 4 days. The viability of the Columbus and Sugargraze grass seeds was 81.50% and 92.50%, respectively.

Keywords: Columbus grass; Germination; Sugargraze; Forage Sorghum Seeds and Viability

INTRODUCTION

Planting seeds are one of the most important components of the agricultural production system. However, the stages of seed germination and seedling development are crucial in the plant's life cycle, as a larger number of healthy seedlings ensure more crop stands in the field and subsequently higher yield (Devi *et al.,* 2022). Seed quality consists of several components, including physical and physiological qualities. The quality of the seeds physically can be seen from their appearances, such as full seed, color, and purity (Wulansari *et al.,* 2023).

Sorghum (*Sorghum bicolor* (L) Moench) is a C4 herbaceous annual grass that is grown from seed in the summer for fodder production (Pushparajah and Sinniah, 2018; Srinivasa Rao *et al.,* 2013). It is regarded as the fifth most important grain in the world (Pushparajah and Sinniah, 2018. Sugargraze (*Sorghum bicolor L.* × *Sweet sorghum* × *Sorghum sudanese L.*) is a top-quality three-way cross of Sorghum, Sweet Sorghum and Sudan grass that was developed for grazing, green chop or hay (Kumar *et al.,* 2022; Ranajit *et al.,* 2022; Kar *et al.,* 2016). Sugargraze have a quick growth rate, multi-cut (3-5), sweet, succulent stalks, and broad, deep green leaves that produce great quality fodder (Bandara *et al.,* 2016; Kar *et al.,* 2016). The forage sorghum known as Columbus grass (*Sorghum almum parodi*), a stable and balanced cross between grain sorghum (*Sorghum bicolar*) and Sudanese grass (*Sorghum sudanese*), was developed in Argentina (Muhammad, 2019; Na-Allah *et al.,* 2017). One of the many fodder plants introduced to Nigeria for use in both intensive and extensive ruminant livestock production systems is Columbus grass (Muhammad, 2019).

The seed viability test provides information on the ability to germinate a seed under optimum conditions, whereas vigor is the ability of seeds to grow and produce normally under suboptimal conditions (Wulansari *et al.,* 2023). Viability and vigor testing of seeds is indispensable to ensure the

quality status of seeds before planting, because one of the indicators of quality seeds is high vigor and germinability (Wulansari *et al.,* 2023). High-quality seeds will help farmers produce at high productivity; however, one of the main problems observed in the field is poor seedling formation, which is influenced by seed quality, climatic conditions, and field management practices (Zhu *et al.,* 2010). High-vigor seeds can improve forage/fodder yield in two ways: first, because seedling emergence from the seedbed is rapid and uniform and the resultant plants are vigorous, and second, because the percentage of seedling emergence is high, plant population density can be achieved under a wide range of environmental conditions (Ghassemi-Golezani *et al.,* 2008). The main objective of this study is to assess the two forages sorghum (Sugargraze and Columbus grass) seeds for viabilities and also to determine their germination rates in laboratory.

MATERIALS AND METHODS

Description of the study area

The experiment was conducted in Animal Science Laboratory, Department of Animal Science, Federal University Dutse, Jigawa State, with coordinates of latitude 11.00^0 N to 13.00^0 N and longitude 8.00^0 E to 10.15^0 E (Gumel *et al.,* 2020). The means of monthly weather parameters: temperature (°C) and total rainfall (mm) for the years 2021 and 2022 were reported in Table 1:

Table 1: Dutse weather reports for the years 2021 and 2022.

Months	2021		2022	
	TP (°C)	TR (mm)	TP (°C)	TR (mm)
March	37.6	0	36.9	0
April	40.5	0	40.3	8
May	40.5	11	39.7	0
June	36.6	108	35.0	142
July	31.3	219	31.4	151
August	31.6	173	29.4	460
September	33.6	64	30.3	253
October	36.7	26	33.2	8
November	36.6	0	33.7	0
Total	-	601	-	1022
AVR	36.1	-	34.4	-

Source: NAERLS/FMARD (2022).

Experimental test materials

The experimental materials were seeds of Sugargraze (*Sorghum bicolor L.* × *Sweet sorghum* × *Sorghum sudanese L.*) and Columbus grass (*Sorghum almum* Poradi) – (*Sorghum bicolor L.* × *Sorghum sudanese L*); sourced from National Animal Production Research Institute (NAPRI) Shika, Zaria.

Laboratory Germination Percentage of the Sugargraze Seeds and Columbus grass Seeds

The seeds germination test method (between paper method) was used as described by (Bicksler, 2011); two hundred (200) seeds each of Sugargraze and Columbus grass were used with Twenty (20) seeds each per Glass Petri dish and replicated Ten (10) times. Permanent marker was used to label the containers. The cut substrate papers (double-folded papers towel) were fit in the sterilize glass petri dishes and the seeds were placed uniformly in between the moist double-folded substrate papers with none of the seeds touching each other. Adequate amount of distilled water was sprayed to completely moisten the papers without soaking. The glass petri dishes were sealed with lid covers, set in a bright location of the lab, and left at room temperature (between 28 and 30 ^{0}C) for a period of seven (7) days. The Petri dishes were examined, the sprouted seeds were counted for each replicate and were recorded after seven days, to calculate the % germination rate or germinability (Bicksler, 2011).

Statistical data analysis

The laboratory viability test data collected was subjected to T-test using Microsoft excel (10th Edition) for the determination of percentages.

RESULTS AND DISCUSSION

Laboratory Germination Rate of the Cultivars (Sugargraze and Columbus grass)

Figure 1 describes the germination rate of Sugargraze seeds and Columbus grass seeds. For all cultivars, the percentage of laboratory germination increased significantly as incubation days increased. Columbus grass, which showed germination rates of 39.50%, 70.50%, and 81.50% at 2, 4, and 6 days, respectively, Sugargraze showed germination rates of 58.50% and 92.50% at days 2 and 4. Sugargraze seeds germinated entirely in 4 days, compared to 6 days for Columbus grass seeds. The Columbus and Sugargraze grass seeds have respective viabilities of 81.50% and 92.50%, according to the results. The results of these investigations were consistent with those of Devi *et al*. (2022), who discovered that 92%, 92%, 96%, 88%, and 88% of the seeds of black grams, maize, rice, tomatoes, and groundnuts germinated in the laboratory. It's common knowledge that laboratory seed germination studies don't reliably predict typical field germination. According to Wulansari *et al*. (2023), field test procedures must thus be investigated in order to guarantee seed quality.

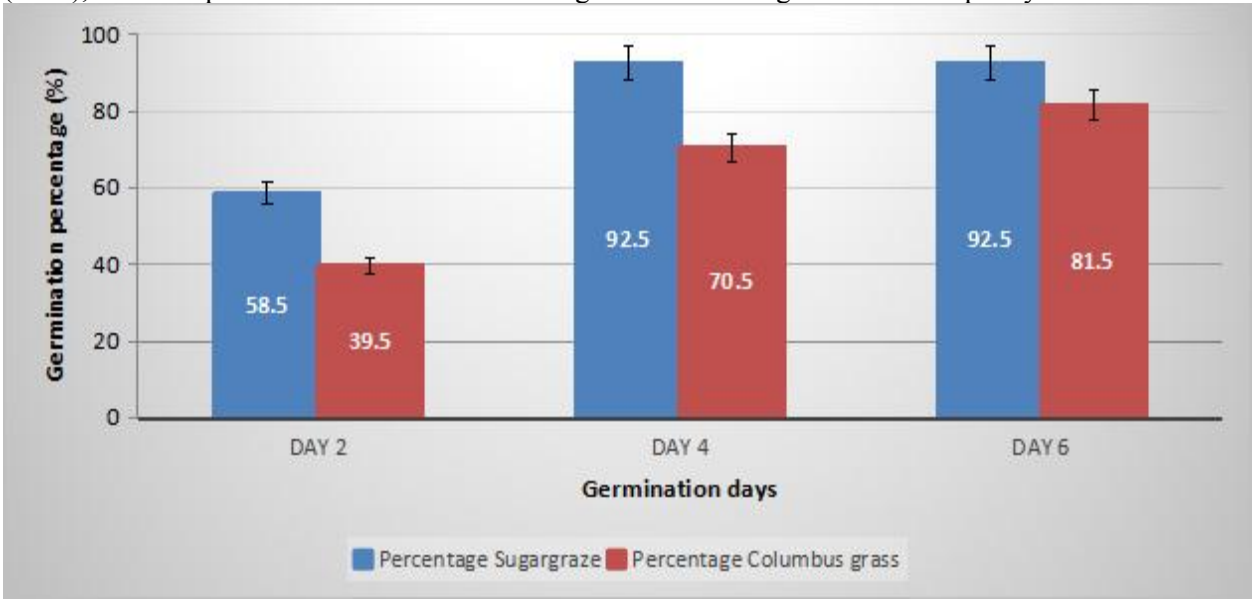

Figure 1: Laboratory seeds viability test with percentage of germinated seeds (viable seeds) of the Cultivars

CONCLUSION AND RECOMMENDATION

In conclusion, a viability test in the lab was conducted by counting how many seeds sprouted after a week. The findings demonstrated that although Sugargraze seeds took only 4 days to fully germinate, Columbus grass seeds required 6 days. The analysis's findings indicated that there was a notable variation in the two types' percentages of laboratory emergence during the observation periods, due to differences in nature of the two types of forage sorghum seeds, Columbus grass seeds were hard with scaly coat and they suggested that, the seeds should be treated by soaking in water 24 hours before being sown to facilitate simple germination.

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